voltage is applied can be less than that in the reverse blocking IGBT according to the related art.

[0106] Next, a method of calculating the effective total amount of impurity of the n-type high-concentration region **45** will be described. FIG. **22** is a characteristic diagram illustrating an impurity concentration distribution along the cutting line C-C' of FIG. **19**. A reverse blocking IGBT was produced (manufactured) according to Embodiment 2. The rated voltage was 600 V and the resistivity and thickness of the semiconductor substrate were 28 Ωcm and 100 μm, respectively. That is, the resistivity of the n^- drift region **1***a* is 28 Ωcm. First, in the reverse blocking IGBT, as illustrated in first to fourth measurement results **51** to **54** of FIG. **22**, the amount of impurity of each region in the semiconductor substrate was measured.

[0107] The first measurement result **51** is the impurity concentration distribution of the n^- drift region **1***a*. The second measurement result **52** is the impurity concentration distribution of the p base region **42**. The third measurement result **53** is the impurity concentration distribution of the p collector region **10***a*. The fourth measurement result **54** is the impurity concentration distribution of the n-type high-concentration region **45**. That is, FIG. **22** illustrates the amount of conductive impurity in each region of the semiconductor substrate in the depth direction. The fourth measurement result **54** indicating the impurity concentration distribution of the n-type high-concentration region **45** indicates the impurity concentration distribution in which impurity concentration has a peak at a predetermined depth and is reduced toward two main surfaces of the substrate, that is, the front surface and the rear surface.

[0108] The amount of impurity at each depth in the fourth measurement result **54** was integrated to calculate the total amount of impurity of the n-type high-concentration region **45**. According to this method of calculating the total amount of impurity of the n-type high-concentration region **45**, it is possible to calculate the total amount of impurity of the n-type high-concentration region **45** even though the impurity concentration distribution of the n-type high-concentration region **45** is not uniform. Then, a value obtained by subtracting the amount of impurity of a portion of the n^- drift region **1***a* in which the n-type high-concentration region **45** is provided from the total amount of impurity of the n-type high-concentration region **45** is the effective total amount of impurity of the n-type high-concentration region **45**.

[0109] That is, a hatched portion which is denoted by reference numeral **50** is the effective total amount of impurity of the n-type high-concentration region **45**. The amount of impurity of the portion of the n^- drift region **1***a* in which the n-type high-concentration region **45** is provided means the total amount of impurity of the n^- drift region **1***a* in the portion of the n^- drift region **1***a* in which the n-type high-concentration region **45** is provided. The total amount of impurity of the n^- drift region **1***a* is calculated by integrating the amount of impurity in the depth direction, similarly to the calculation of the total amount of impurity of the n-type high-concentration region **45**.

[0110] Next, the relationship between the reverse direction breakdown voltage and the effective total amount of impurity of the n-type high-concentration region **45** was verified. FIG. **23** is a characteristic diagram illustrating the relationship between the reverse direction breakdown voltage and the effective total amount of impurity of the n-type high-concentration region in the reverse blocking IGBT according to Embodiment 2. A plurality of reverse blocking IGBTs (hereinafter, referred to as second examples) in which the n-type high-concentration regions **45** had different effective total amounts of impurity were manufactured. In each of the second examples, the effective total amount of impurity of the n-type high-concentration region **45** was in the range of 1.0×10^{11} cm^{-2} to 8.0×10^{11} cm^{-2} (which holds for FIG. **24**). The n-type high-concentration region **45** was arranged at a position that was 10 μm away from the p collector region **10***a*. For comparison, the reverse blocking IGBT without the n-type high-concentration region **45** according to the related art (the above-mentioned comparative example) was prepared.

[0111] In the second examples and the above-mentioned comparative example, the reverse breakdown voltage was measured, with a collector-emitter voltage being 600 V (the emitter potential with respect to the collector potential is negative) and the gate being short-circuited to the emitter. The measurement result is illustrated in FIG. **23**. In FIG. **23**, a case in which the effective total amount of impurity of the n-type high-concentration region **45** is zero is illustrated as the comparative example. The result illustrated in FIG. **23** proved that, when the n-type high-concentration region **45** was provided, it was possible to reduce the reverse breakdown voltage. In addition, it was verified that, as the effective total amount of impurity of the n-type high-concentration region **45** increased, the reverse breakdown voltage could be reduced. Therefore, it was verified that, when the effective total amount of impurity of the n-type high-concentration region **45** was appropriately set, it was possible to adjust the reverse breakdown voltage so as to be close to a predetermined breakdown voltage (rated voltage).

[0112] Next, the relationship between the effective total amount of impurity of the n-type high-concentration region **45** and a forward leakage current was verified. FIG. **24** is a characteristic diagram illustrating the relationship between the effective total amount of impurity of the n-type high-concentration region and the forward leakage current in the reverse blocking IGBT according to Embodiment 2. In the second examples and the comparative example, the forward leakage current was measured, with the collector-emitter voltage being 600 V and the gate being short-circuited to the emitter. The measurement result is illustrated in FIG. **24**. In FIG. **24**, a case in which the effective total amount of impurity of the n-type high-concentration region **45** is zero is illustrated as the comparative example. The result illustrated in FIG. **24** proved that, when the n-type high-concentration region **45** was provided, it was possible to reduce the forward leakage current. In addition, it was verified that, as the effective total amount of impurity of the n-type high-concentration region **45** increased, the forward leakage current could be reduced. As can be seen from FIGS. **23** and **24**, when the effective total amount of impurity of the n-type high-concentration region **45** was about 3.0×10^{11} cm^{-2}, the forward leakage current could be set to about 0.7 (A.U) at a reverse breakdown voltage higher than about 600 V. Therefore, when the effective total amount of impurity of the n-type high concentration region **45** is equal to or greater than zero and equal to or less than 3.0×10^{11} cm^{-2}, it is possible to increase the reverse breakdown voltage to the rated voltage or more, to reduce the breakdown voltage, and to reduce the forward leakage current.

[0113] Next, the charge resistance of the reverse blocking IGBT according to Embodiment 2 was verified. FIG. **25** is a characteristic diagram illustrating the charge resistance of the